Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

PRELIMINARY NOTES ON SOME IGNEOUS ROCKS OF JAPAN. II[1]

S. KÔZU
Imperial Geological Survey of Japan

II. QUARTZ-BASALT

Locality.—Kasa-yama, near Hagi city, prov. Nagato.

Occurrence.—The rock occurs as a lava flow erupted at the volcano Kasa-yama, which consists merely of an isolated cone of small size, 112.5 meters above the sea-level and about 1,300 meters in diameter across its base. In the summit, there is a perfectly preserved crater, 25 meters in diameter and 13 meters in depth. This small and regular cone stands in strong contrast to the topography of the environs, where the geology is mainly composed of granites and mesozoic sedimentaries, and especially to that of table-lands or flat islands formed by basalt flows which poured out here and there through the ground.

Age.—The eruption of the rock appears to be Diluvium and the latest of the basalt in this region, which seem to have been erupted at the period from the close of Tertiary to Diluvium.

Megascopic characters.—The specimen collected from the lava dam near the Shinto shrine at the eastern foot of Kasa-yama is noteworthy for containing abundant quartz as porphyritic grains in a hypocrystalline groundmass. It is black in color and vesicular with small and irregular cavities, but has a high specific gravity. The quartz, varying in size from 1 mm. to 5 mm., shows an irregular outline, but sometimes almost hexagonal. Though the percentage of quartz grains varies in different portions of the lava, generally they are distributed uniformly and are clearly distinguishable from the groundmass by their color, as seen in the photograph. Besides these there are only a few crystals of yellow

---

[1] Published by permission of the Director of the Imperial Geological Survey of Japan.

olivine as megascopic phenocrysts. This mineral is 2 mm. in diameter, and is also fresh in aspect.

Microscopical characters.—The mineral components are olivine, augite, plagioclase, magnetite, and apatite, with phenocrystic quartz. The microscopic phenocrysts are not abundant; among them the olivine is most common, then follows the augite in nearly equal amounts; the plagioclase occurs subordinately. The groundmass is hypocrystalline in texture and consists of lath-shaped plagioclase, prismatic or granular augite, and magnetite crystals, with abundant interstitial glass of light-brown color, clouded by numerous globules.

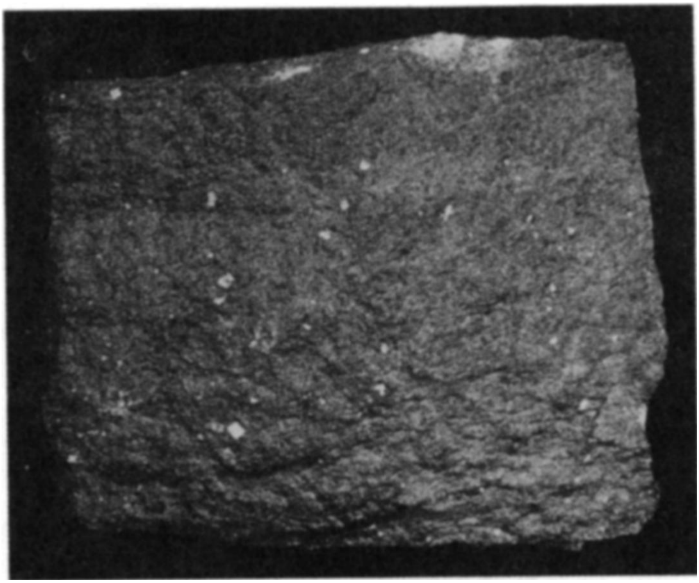

FIG. 1.—Quartz-basalt. ×½. The white grains are quartz.

Olivine belongs to the earlier crystallization among the mineral ingredients of the rock, and is almost free from inclusions with the exception of a few crystals of magnetite and glass, which are very rare. It forms anhedral to subhedral shapes with finely ragged outline, and about it minute granules of pyroxene may be observed.

The olivine is entirely fresh and remarkably but irregularly cracked.

Augite is very faint yellowish or nearly colorless, and is more abundant than olivine, though it is rarely present as microscopic phenocrysts. As phenocrysts, it is anhedral, but in the groundmass it is well shaped; elongated prisms are common. In rare instances, twinning parallel to the orthopinacoid may be seen in the larger crystals. In the reaction-border about the phenocrystic quartz, augite is the only mineral constituent and is imbedded in brown glass. Inclusions of magnetite, apatite, and glass are sparingly present.

Plagioclase is basic labradorite and appears in well-formed, long prismoids with polysynthetic twinning according to the Carlsbad and albite law. Zoning is almost absent. Minute grains of pyroxene and magnetite are present as inclusions in small quantity, with also a few of glass.

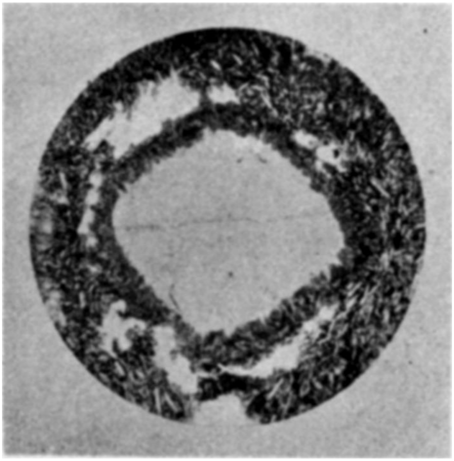

FIG. 2.—Bipyramidal quartz with reaction border. ×23.

Quartz occurs as a porphyritic constituent, and the average diameter is about 2 mm. The outline of the mineral in thin section is usually irregular, but sometimes shows the bipyramidal form referable to crystallographic faces, as seen in the microphotograph (Fig. 2). Each grain of quartz is fringed with a reaction-border, consisting of elongated prism and grains of augite imbedded in brown glass. The minute prismoids are arranged quite regularly. They are grouped radially, each group containing a few crystals that converge toward the outer side of the border, as seen in Fig. 2. In triangular, interstitial spaces between each radial group granular augites are scattered irregularly. In some instances, the deep invasion of the brown glass, with very fine crystals of augite, is observed along the cracks in the quartz. Glass inclusions with gas bubbles are present in bipyramidal shapes, and ruptures starting from the four corners of the rhombic sections are well marked in thin sections of the mineral nearly parallel to the optic axis, as shown in Figs. 3 and 4.

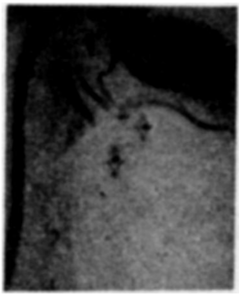

FIG. 3

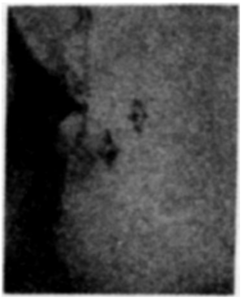

FIG. 4

Chemical characters.—The analysis of the rock, shown in column A in the following table, was made by T. Ōno in the laboratory of the Imperial Geological Survey of Japan. The analysis of the quartz-basalt from the north base of Lassen peak, described by Diller, is given in column B.

	A	B
SiO_2	56.08	56.51
Al_2O_3	18.12	18.10
Fe_2O_3	2.46	4.26
FeO	6.97	2.68
MgO	3.13	4.52
CaO	7.14	8.15
Na_2O	2.02	3.23
K_2O	1.50	1.15
H_2O	0.15*	0.69
TiO_2	1.31	0.48
P_2O_5	tr.	0.14
MnO	0.34	0.11
BaO	....	0.04
Cr_2O_3	....	tr.
SrO	....	0.04
LiO	....	tr.
	99.22	100.10

A. Quartz-basalt (lava). Kasa-yama, prov. Nagato.
B. Quartz-basalt (lava). North base of Lassen Peak, California.

* Loss on ignition.

On comparing the analyses, it is obvious that the two rocks are closely similar in chemical characters, but the rock of Kasayama differs slightly in containing lower magnesia, lime, and alkalies, and higher iron and titanium; the low value of the first component especially does not satisfy Harker's hypothesis with regard to the plotting of his diagram.

Norms, calculated from the analyses, are as follows:

	A	B
Quartz	14.8	10.9
Orthoclase	8.9	7.2
Albite	16.8	26.7
Anorthite	35.3	31.4
Corundum	0.2	....
Diopside	....	7.1
Hypersthene	16.9	8.6
Magnetite	3.7	6.3
Ilmenite	2.4	0.9
	99.0	99.1

From the norms, ratios are given as below:

	A	B
$\frac{\text{Sal}}{\text{Fem}}=$	3.30	3.33
$\frac{Q}{F}=$	0.24	0.17
$\frac{K_2O'+Na_2O'}{CaO'}=$	0.38	0.57
$\frac{K_2O'}{Na_2O'}=$	0.50	0.25

By the Quantitative System these rocks are classified as bandose.